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THE FLORA OF MOHAWK HILL, N. Y., NORTH OF THE WATERSHED

BY T. A. BENDRAT

On the basis of several seasons' work the writer endeavors to show in the present paper the general distribution of plant-forms north of the watershed that separates the drainage system of the Black River from that of the famous Mohawk, and which have been established at an elevation of about 1,700 feet, between latitude $43^{\circ} 30'$ and $43^{\circ} 35'$.

The area investigated comprises the drainage basin of the Sugar River, a western tributary of Black River, and more especially that of Amster Brook, which is a southern tributary of Sugar River. The area is limited on the south by the watershed itself and on the north by the valley of the Sugar River into which it gradually merges.

A partial list of the more common seed-bearing plants of the region is followed by a more or less condensed discussion of the various formations, their mode of occurrence and their relation to one another, and also by a subjoined formation-map which has been constructed on the basis of a topographic map and which may serve to emphasize, at least for a portion of the area under discussion, the facts brought out in this paper. The topographic map is also the work of the writer.

LIST OF THE MORE COMMON SEED-BEARING PLANTS, WITH NOTES ON THEIR HABITATS AND FLOWERING AND FRUITING PERIODS*

GYMNOSPERMAE

Abies balsamea (L.) Mill. Found both in lowlands and uplands, in the valley and gulf formation as well as in the plateau-forest formation. Flowering early in June.

* Wherever the date, as July-August, is given it applies only to the period of flowering. The writer has also indicated the period of fruiting, for many species, as will be noted in the text.

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- Picea canadensis* Mill. In gulfs and ravines as well as in the upland-forest formation, scattered. April-May.
- Picea brevifolia* Pk. In swampy places in gulfs and ravines as well as in the uplands. May and June. It is taken by some writers to be a small form of the black spruce.
- Pinus resinosa* Ait. May to June. In the plateau-forest formation and occasionally in the gulfs and valleys.
- Larix laricina* (Du Roi) Koch. Member of the plateau-forest formation. In March and April.
- Picea Mariana* (Mill.) B.S.P. Occurs with the red spruce. May and June.
- Tsuga canadensis* (L.) Carr. Scattered singly over the uplands and occasionally found in the bottom of valleys and gulfs. April and May.
- Thuja occidentalis* L. Along the streams in the bottom of valleys and ravines as well as on the slopes. Preferring wet grounds. May and June.

ANGIOSPERMAE

MONOCOTYLEDONES

- Typha latifolia* L. Very common in colonies and scattered through swamps, sloughs and ponds, also through swampy places amidst pine-woods in plateau formation, attaining a height of over five feet. July.
- Sparganium simplex* Huds. Only found along banks of Upper Amster Brook, in small, scattered groups. July.
- Agrostis alba* L. In damp and wet slopes of gulfs and their tributaries. August.
- Agrostis alba vulgaris* (With.) Thurber. Common in pasture and meadow formation, scattered. August.
- Anthoxanthum odoratum* L. In pastures and back yards, in open places, scattered, also in meadows. June.
- Panicum capillare* L. Scattered along waysides, over slopes and open places. July.
- Phleum pratense* L. One of the members of the meadow formation. May.

The grass family of this region is characterized by its scarcity, so far as the number of genera are concerned. Especially in the

uplands about the so-called "back woods," where pastures have resulted from the clearing of the woods, and in the morainic region where the surface is strewn over with boulders of all sorts, the grass family is meagerly represented. The same holds true with regard to its development in the lowlands, although to a less extent.

Carex pauciflora Lightf. In tufts together with *Iris* and *Juncus* in wet and swampy places along streams and near springs. July.

Carex gynandra Sehwa. In bottom of gulfs and their tributaries. July. Usually in solitary clumps.

Carex tribuloides moniliformis Britton. In bottom of Agnes Creek (see map). July. Usually solitary.

Arisaema triphyllum (L.) Torrey. In woods on the uplands and also in wooded slopes of gulfs and their tributaries. Flowering in June and fruiting in August.

Juncus canadensis J. Gay. In wet and swampy places in uplands as well as in the bottom of main streams and their tributaries, also on their slopes near springs. August.

Juncus marginatus L. Together with *J. effusus* and *Iris versicola* in wet and swampy places in bottom and slope of gulfs and their tributaries, as well as in swampy pastures on the uplands. July.

Veratrum viride Ait. Solitary, scarce, in bottom of gulfs and ravines.

Uvularia sessilifolia L. In rich woods and woody slopes of gulfs and ravines, single and scattered. June.

Allium cernuum L. In clearings in wooded slopes of Lamey's Hill, north of middle Amster Brook. July.

Erythronium americanum Ker. In woods. Occasionally in small groups. May.

Lilium bulbiferum L. In bottom of main and tributaries of Amster Brook and other larger streams, north of the watershed of Mohawk Hill, also in swampy ground together with *Typha* between Mohawk Hill and Boonville. July.

Medeola virginica L. Indian Cucumber Root. In low, wooded grounds, along streams, solitary. June.

- Unifolium canadense* (Desf.) Greene. On slaty slope and in brow of tributary (Agnes creek) in shade of trees in more or less extensive groups. Flowering in June and July, fruiting in July and August.
- Trillium cernuum* L. Single and in scattered small clusters in shade of evergreens in upland "back woods" and in wooded bottom of gulfs, flowering in May, fruiting in August.
- Trillium erectum* L. In the shade of evergreens like the foregoing, scattered singly and in small groups. May and June.
- Iris versicola* L. Solitary and in small clusters in swamps amidst pine woods and in swampy ground along streams. July.
- Sisyrinchium bermudianum* Mill. Scattered singly or in very small clusters in hilly pastures and along roads. June.
- Cypripedium acaule* Ait. Single and in small groups in shade of evergreens in gulfs and plateau-lands. June.
- Habenaria psycodes* (L.) Gray. In swamps amidst pine woods, very rare, solitary. July.
- Gyrostachys plantaginea* Britton. In pastures and meadows, scattered. September.
- Gyrostachys gracilis* Kunze. In slopes and bottom of gulfs, preferring wooded lands. August.

DICOTYLEDONES

CHORIPETALAE

- Juglans cinerea* L. Scattered singly through main gulf of Amster Brook, and through other gulfs and ravines of the region, also on the plateau.
- Hicoria minima* (Marsh) Britton. In moist woods and swamps of the plateau-forest and also the plateau-swamp formations. It flowers in May and June and fruits from September to October.
- Populus tremuloides* Michx. In dry or moist soil, mostly confined to the plateau-valley formation, in bottom of Amster Brook Valley. March-May.
- Salix alba* var. *vitellina* L. Occasionally found along roads and also near water courses. Also occurring in small thickets. April and May.

Salix fragilis L. Found along roadsides, usually solitary and rare.

These two species are practically the only ones that represent *Salix* in this region.

Alnus incana (L.) Willd. Forming more or less extensive thickets along watercourses and in low swampy ground that has passed from the pond into the swamp condition. It flowers in May and fruits in August.

Fagus grandifolia Ehrh. In more or less extensive formations on first and second (more recent) terraces in bottom of most drainage areas in the region. Associated with pine and thus constituting a mixed formation (pine-beech or beech-pine, as the case may be). It flowers in April and May, fruits in September and October.

Ulmus americana L. In moist soil, especially along streams. Flowers in March and April, fruits in May.

Urticastrum divaricatum (L.) Kuntze. In moist and wooded banks of Amster brook and its tributaries, rare. Flowering in July, fruiting in August and September.

Polygonum arifolium L. In ponds in pine woods, occurring in groups. July.

Claytonia caroliniana Michx. In meadows and pine barrens, in small colonies. One of the first plants to appear, after the snow is gone. End of April.

Cerastium longipedunculatum Muhl. Very common in open slopes and bottom of gulfs. July.

Caltha palustris L. In colonies in swampy pastures, along ditches and natural watercourses. June and July.

Aquilegia canadensis L. Rare. In small groups in alluvial bottom of Amster Brook. Flowering in May and June, fruiting in July and August.

Actaea alba (L.) Mill. In rich wooded slopes of Amster Brook and other streams, rare. Flowering in June, fruiting in August.

Clematis trifolia Salisb. In small groups in pine-barrens and damp wooded slopes, belonging to the plateau-valley and gulf formation. May.

- Clematis virginiana* L. Solitary in moist wooded slopes of Amster Brook. August.
- Ranunculus abortivus* L. Solitary, in shady places along streams and in the slopes of gulfs and valleys. Flowering in May and June.
- Ranunculus recurvatus* Poir. In meadows and moist open places, scattered. July until September.
- Ranunculus pennsylvanicus* L. In open slopes and valley bottoms. Forming mats.
- Ranunculus repens* L. Solitary, scattered, in meadow.
- Thalictrum dioicum* Muhl. In rocky ground in woods, in slaty slope of Amster Brook. July.
- Caulophyllum thalictroides* Michx. In more or less extensive groups in bottom of Amster Brook gulf, in shade of trees. Flowering in June and fruiting in August.
- Cardamine hirsuta* L. Very rare, in slaty slope of gulfs. Solitary. July.
- Chrysosplenium americanum* Schw. In swampy ground in pine woods on Mohawk Hill plateau, in more or less extensive colonies. May.
- Tiarella cordifolia* L. Along streams and on wooded slopes of gulfs. May.
- Agrimonia mollis* Britton. In boulder clay in bottom of ravines and gulfs. Solitary. July–Oct.
- Potentilla Monspeliensis* L. In open places in bolder clay and along roads. Solitary. September.
- Potentilla recta* L. Rare; in pine barrens, and occasionally in waste ground; solitary. August.
- Rubus odoratus* L. Only found in gulf of Graham Creek. Together with *Impatiens fulva*, *I. pallida* and rattlesnake root it constitutes the flora of that gulf; rather confined to the lower slopes. *Rubus strigosus* Michx. Roadsides and along fences on uplands and also in the slopes and bottoms of ravines and gulfs. Flowering May–July; fruiting July–September.
- Rubus canadensis* L. In pastures and along roads of the upland. Flowering May–June; fruiting July and August.

Fragaria canadensis Michx. Member of the plateau-valley and gulf formation. In the slopes of gulfs, ravines and valleys. Associated with *Viola obliqua*. May-July.

Fragaria americana (Porter) Britton. Scattered through woods in the uplands; in clearings and about the hillocks caused by the uprooting of trees. Very sweet. May-June.

Rosa lucida L. Very extensive along roads and also along margin of woods.

Prunus serotina Ehrh. Scattered in valleys and gulfs of the region, especially in ravine of Agnes Creek (see map). Flowering in June; fruiting in August and September.

Prunus pennsylvanica L. Along stone fences and stone walls on the uplands, also along margin of plateau-meadow formation. Fruiting in July.

Prunus virginiana L. Very common on uplands and occasionally descending into the gulfs and ravines. Flowering June-July; fruiting in July or August.

Geranium Robertianum L. In wooded slopes; solitary and in small groups. July.

Oxalis Acetosella L. In groups, scattered over the slaty slopes of Amster Brook and its tributaries, together with *Oxalis stricta*. July.

Acer Saccharum Marsh. In rich soil of hills, valleys, and mountain sides. Very common as member of the plateau-forest and the plateau-valley and -gulf-formation. May-June.

Acer rubrum L. Associated with the former. May.

These seem to be the only species of maple occurring in this region, which is characterized, in general, by its vegetative monotony.

Hypericum ellipticum Hook. In small groups as well as in more extensive colonies, in damp and wet places, by waterfall in Amster Brook. July and August.

Hypericum perforatum L. Slaty slopes and banks, in groups. July.

Hypericum mutilum L. Alongside roadside in rather silty soil, solitary or sometimes in extensive groups. July.

- Viola rotundifolia* Michx. In low, damp ground, in bottom of Amster Brook and other gulfs and valleys. Associated with *Viola blanda*. May.
- Viola blanda* Willd. In groups along streams, in bottom of gulfs. May.
- Viola cucullata* Ait. In groups along streams; associated with *Fragaria canadensis*. May.
- Circaea alpina* L. In groups or colonies about springs, in the slopes of rocky gulfs. July.
- Chamaenerion angustifolium* (L.) Scop. In slaty slopes of gulfs and along waysides, in small groups. July.
- Epilobium strictum* Muhl. In swampy grounds, amidst pine woods on Mohawk Hill plateau, scattered. July.
- Epilobium palustre* L. In wet places along streams on the uplands. July.
- Kneiffia pumila* Spach. Solitary and in small groups together with daisies, buttercups, hawkweed and *Stachys*, in meadow formation; also in pine barrens. June.
- Aralia nudicaulis* L. Wooded and shady cliffs and on slopes of valleys and gulfs, scattered and scarce. Flowering in June and fruiting in August.
- Panax quinquefolium* L. Associated with *Aralia nudicaulis* in middle Amster Brook and also in Graham Brook. Fruiting in August.
- Aralia racemosa* L. Solitary, very rare, also associated with sarsaparilla; in shady and wooded slopes of Amster Brook and Graham Brook. Fruiting in August.
- Cornus canadensis* L. In open pine woods as well as in pastures in more or less small groups; member of the pasture- and plateau-forest formation. It seems to prefer the shade of trees and a damp atmosphere and flowers in June and July in lower places, while at higher levels it blooms as late as August and September. In the former case it fruits in July.

GAMOPETALAE

- Monotropa uniflora* L. Scattered singly and in small groups of two and three in low, moist and sheltered grounds; very rare. July.

- Gaultheria procumbens* L. Forming extensive mats in spruce formation. Closely associated with the latter.
- Pyrola elliptica* Nutt. Solitary, very rare, in wooded slope of Amster Brook gulf. July.
- Gentiana Saponaria* L. Scattered in small or large groups along road near margin of woods; restricted to the uplands. July.
- Apocynum androsaemifolium* L. Forming occasionally extensive thickets on slopes of gulfs and ravines in boulder clay. July.
- Asclepias incarnata* L. Moist, swampy ground, in bottom of gulfs. July and August.
- Cynoglossum officinale* L. In small groups in bottom of gulfs; specially in moist places. August.
- Myosotis palustris* L. In scattered groups in bottom of gulfs and on cobble-stone islands in the streams.
- Verbena bracteosa* L. In dense and extensive colonies along banks of Upper Amster Brook, near woods; scattered elsewhere. July.
- Agastache scrophulariaefolia* (Willd.) Kuntze. Solitary, in bottom of gulfs. August.
- Lycopus virginicus* L. Scattered over bottom of gulfs. July.
- Mentha canadensis* L. In groups along streams. July.
- Mentha rotundifolia* (L.) Huds. Associated with the former; in groups along bottom of gulfs and ravines. July-Sept.
- Monarda didyma* L. In small groups in slaty banks of Amster Brook. August.
- Scutellaria laterifolia* L. In wet and swampy places amidst pine woods; scattered. July.
- Stachys palustris* L. Solitary, on slope of tributary gulfs. August.
- Teucrium canadense* L. Occurs singly in bottom of Amster Brook gulf. July.
- Scrophularia marylandica* L. In small groups of three or four along streams. August.
- Chelone glabra* L. In groups along roadside and in gulfs, usually in moist places. July.
- Mimulus ringens* L. In swamps and along streams; single and in small groups; confined to the plateau-meadow formation of the uplands. July.

- Veronica americana* Schw. Along brooks in swampy ground, amidst pine woods, scattered. July.
- Veronica scutellata* L. In swamp near Amster Brook above Mohawk Hill cheese factory, the only place where it occurs within this region. July.
- Leptamnium virginianum* (L.) Raf. In more or less extensive groups in first alluvial terrace in Beech Grove. August.
- Galium asprellum* Michx. In swampy grounds amidst pine-woods, climbing on other marsh and swamp plants. In large groups. July.
- Galium triflorum* Michx. Scattered through woods and in slopes of gulfs. July.
- Viburnum alnifolium* Marsh. Scattered through woods on Mohawk Hill plateau; may also be found in bottom of gulfs. Flowers in May and fruits in August.
- Diervilla Diervilla* (L.) MacM. On slopes, specially in gravelly, poor soil. Flowers in July and fruits in August.
- Campanula americana* L. In waste ground and along roads; solitary and in small groups. July.
- Lobelia inflata* L. In pastures and by wayside; also in bottom of gulfs. July–September.
- Lobelia cardinalis* L. Occurs in groups and colonies along brooks, but confined to the uplands and backwoods of the Mohawk Hill Region. July.
- Nabalus altissimus* (L.) Hook. In shady, moist and rocky slopes of gulfs. August.
- Eupatorium ageratoides* L. In wooded, shady and moist slopes of gulfs. August.
- Eupatorium perfoliatum*. In small group. Cobblestone island in midst of Amster Brook, only place where found. August.
- Eupatorium purpureum* L. Along streams in small groups. August.
- Solidago canadensis* L. Waste open places, also along wayside and brow of hills. September.
- Solidago flexicaulis* L. In bottom of valleys and gulfs, in boulder-clay. September.
- Solidago lanceolata* L. With *S. canadensis* and *S. flexicaulis* in groups, flowering and fruiting at same time.

- Aster macrophyllus* L. Along wooded banks of Amster Brook, very rare, solitary. August.
- Aster lateriflorus*, Britton. Occurring singly or in very small groups in moist and wooded slopes of gulfs. August.
- Aster puniceus* L. On slopes and sloping planes, but attaining greatest height (up to 6 feet) and being best developed in moist, swampy clearings in pine woods. August and September.
- Aster Tradescanti* L. Very common in extensive colonies together with different species of *Solidago*. September.
- Erigeron ramosus* (Walt.) B.S.P. Daisy Fleabane. In open places on plateau in bowlder-clay, solitary. September.
- Antennaria plantaginifolia* (L.) Rich. Very common in dry knolls and slopes, sometimes almost exclusively constituting the matting of the surface along highest levels of slopes. Early spring.
- Anaphalis margaritacea* B. & H. Along brow of slopes of gulfs, in groups. August and later.
- Gnaphalium decurrens* L. Along brows of hills and gulfs, also in pretty large colonies along the wayside. September.
- Bidens laevis* (L.) B.S.P. In groups and even colonies in swampy wood-clearings and in open pine formation. August and September.
- Bidens connata* L. Solitary, by water side in silty soil; flowering in August. It is rare.
- Heliopsis laevis* L. Scattered through meadow-formation in rich clayey soil. July.
- Senecio lobatus* L. On shaded slope; solitary or in groups of 2 and 3. August.
- Senecio aureus* L. At foot of wooded slope of Amster Brook, in small groups, rare. July.

FORMATIONS

So far as the region under discussion is concerned, there is a considerable variety of formations caused by a diversity of physiographic conditions. A more or less obscured and modified plateau region is dissected by gulfs and valleys, and consists of

areas that are partly uneven and hilly, and partly level. We find the formations resulting from these physical factors established somewhat as follows:

1. Plateau-Forest Formation.
2. Plateau-Meadow Formation.
3. Plateau-Swamp Formation.
4. Plateau-Gulf-and-Valley Formation.
5. Plateau-Pasture Formation.

While the conditions that developed or at least helped to develop the first four of these formations have been brought about by nature as transitional and final forms of vegetation, the fifth formation, or plateau-pasture formation, has been developed through the activity of man. An enumeration of the different species that constitute the various formations, specially those which make up the facies of each formation, will tend to show which plant-forms are more or less significant for each of the different formations, and which are to be considered as invaders, or rather as common for all or most of them.

1. *Plateau-Forest Formation*

The forest, so far as it occupies the region north of the watershed of Mohawk Hill, at an average elevation of 1,700 feet above sea-level and in horizontal extension between latitude 43° 30' and 44° north, is a mixed formation. It is a mixture of the typical deciduous-leaved and needle-leaved forest-formations, and is passing, at present, from the closed into the open stage, and from that of primary to that of secondary growth.

The predominant character of its flora is mesophytic, although more or less hydrophytic forms may occasionally occur wherever members of the swamp or spring formation have invaded the forest, as is very often the case.

Among trees the more characteristic ones are the following:

<i>Abies alba</i>	<i>Hicoria minima</i>
<i>Abies balsamea</i>	<i>Juglans cineria</i>
<i>Acer Saccharum</i>	<i>Larix laricina</i>
<i>Acer rubrum</i>	<i>Negundo aceroides</i>
<i>Fagus grandifolia</i>	<i>Picea Mariana</i>

<i>Picea canadensis</i>	<i>Tilia americana</i>
<i>Picea brevifolia</i>	<i>Tsuga canadensis</i>
<i>Pinus resinosa</i>	<i>Ulmus americana</i>

Among the shrubs the most characteristic ones are:

<i>Alnus viridis.</i>	<i>Rubus strigosus</i>
<i>Gaylussacia frondosa</i>	<i>Rubus setosus</i>
<i>Rosa lucida</i>	<i>Viburnum alnifolium</i>

The layer of spore- and seed-bearing plants (herbs), rising above the carpet and mat formation of the forest, consists of the following species:

<i>Allium cernuum</i>	<i>Medeola virginiana</i>
<i>Arisaema triphyllum</i>	<i>Pyrola elliptica</i>
<i>Aster puniceus</i>	<i>Unifolium canadense</i>
<i>Clematis virginiana</i>	<i>Thalictrum dioicum.</i>
<i>Coptis trifolia</i>	<i>Tiarella cordifolia.</i>
<i>Malva sylvestris</i>	<i>Trillium cernuum</i>
<i>Leptamnium virginanum</i>	<i>Trillium erectum</i>
<i>Erythronium americanum</i>	<i>Urticastrum divaricatum</i>
<i>Fragaria americana</i>	<i>Uvularia sessilifolia</i>
<i>Galium trifolium</i>	<i>Viola pubescens</i>
<i>Gentiana Saponaria</i>	<i>Viola rotundifolia</i>
<i>Geranium Robertianum</i>	

The mat- and carpet-covering of the forest consists of the following forms:

<i>Gaultheria procumbens</i>	<i>Polytrichum ohioense</i>
<i>Lycopodium complanatum</i>	<i>Russula cristosa</i>
<i>Lycopodium lucidulum</i>	<i>Russula foetens.</i>
<i>Lycopodium dendroidus</i>	

So far as the distribution of the forest formation is concerned, only limited and isolated patches remind one of the fact that the entire region was once forest, excepting the areas where the meadow formation has established itself. There are lines of forest formation along the crests of gulfs and valleys and there is forest formation to be found on the slopes and in the bottoms of such gulfs and valleys, wherever the lumbering activity of man has not promoted a gradual increase of the typical plateau-gulf and -valley formation at the expense of the plateau-forest

formation. Wherever conditions are favorable the latter may be observed again claiming the ground it once had occupied and migrating vertically, either down or up the slope, and horizontally by invading waste land and pastures, as well as by competing to some limited extent with the meadow formation.

2. Plateau-Meadow Formation

The plateau-meadow formation, as the second stage of succession, has established itself especially upon areas that exhibit a somewhat high degree of smoothness—and, while at some places it has attained the culmination-point of its development, it may be found at others still competing with and passing out of the plateau-swamp formation.

Its facies is to a great extent determined by the altitude of the region, by the character of the soil, which is a buff-colored, more or less gravelly boulder-clay about one or at the most two feet thick, and by the bed-rock. This bed rock of Utica slate helps to control the water-content.

The species, constituting the meadow formation, are as follows:

<i>Agrostis alba</i>	<i>Oxalis stricta</i>
<i>Agrostis alba vulgaris.</i>	<i>Panicum capillare</i>
<i>Anthoxanthum odoratum</i>	<i>Phleum pratense</i>
<i>Bidens frondosa</i>	<i>Poa annua</i>
<i>Epilobium palustre</i>	<i>Ranunculus acris</i>
<i>Fragaria virginiana</i>	<i>Ranunculus repens.</i>
<i>Heliopsis laevis</i>	<i>Rumex Acetosella</i>
<i>Hypericum ellipticum</i>	<i>Sisyrinchium bermudianum</i>
<i>Hypericum perforatum</i>	<i>Gyrostachys sp.</i>
<i>Oenothera pumila</i>	<i>Verbena angustifolia</i>
<i>Oxalis Acetosella</i>	<i>Viola obliqua</i>

As may be readily seen from the list, the meadow formation sometimes merges into the pasture formation and *vice versa*, wherever the two happen to occur side by side.

3. Plateau-Swamp Formation

The swamp formation occurs either within the forest formation or within the pasture as well as the gulf and valley formation,

wherever the basal structure of the area concerned has allowed its development. While at some places it appears to be fully developed, at others it is observed to lose ground at the expense of the pasture and meadow formations. Even in the forest it appears to yield gradually to the invading thicket and forest zone.

The more characteristic forms observed are as follows:

<i>Alnus incana</i>	<i>Iris versicola</i>
<i>Aster puniceus</i>	<i>Hicoria minima</i>
<i>Bidens laevis</i>	<i>Juncus canadensis</i>
<i>Calltha palustris</i>	<i>Juncus marginatus</i>
<i>Carex gynandra</i>	<i>Mimulus ringens</i>
<i>Carex pauciflora</i>	<i>Myosotis palustris</i>
<i>Carex tribuloides moniliformis</i>	<i>Polygonum arifolium</i>
<i>Chrysosplenium americanum</i>	<i>Scutellaria lateriflora</i>
<i>Epilobium molle</i>	<i>Sparganium simplex</i>
<i>Galium asprellum</i>	<i>Typha latifolia</i>
<i>Galium trifidum</i>	<i>Veronica americana</i>
<i>Habenaria psychodes</i>	<i>Veronica scutellata</i>

4. Plateau-Gulf and Valley Formation

This formation appears, wherever the lumbering activity of man has removed the forest formation along the lines of drainage on the deformed plateau. It is naturally composed of mesophytic forms which occupy especially the slopes of valleys, gulfs, and ravines. Xerophytic forms are usually restricted to the higher and highest levels of slope and to such restricted areas within the bottom of gulfs and valleys which from the nature of the soil-conditions favor their development. Also hydrophytic species have taken advantage of conditions more or less prevailing in the bottom of these drainage channels.

As a subdivision we might include here the spring formation which might be considered as a mixture of hydrophytic and mesophytic forms in so far as springs develop amidst a mesophytic flora and introduce hydrophytic species into the latter, although plants, typical for the swamp formation, may be lacking. This however does not exclude the possibility of conditions that ac-

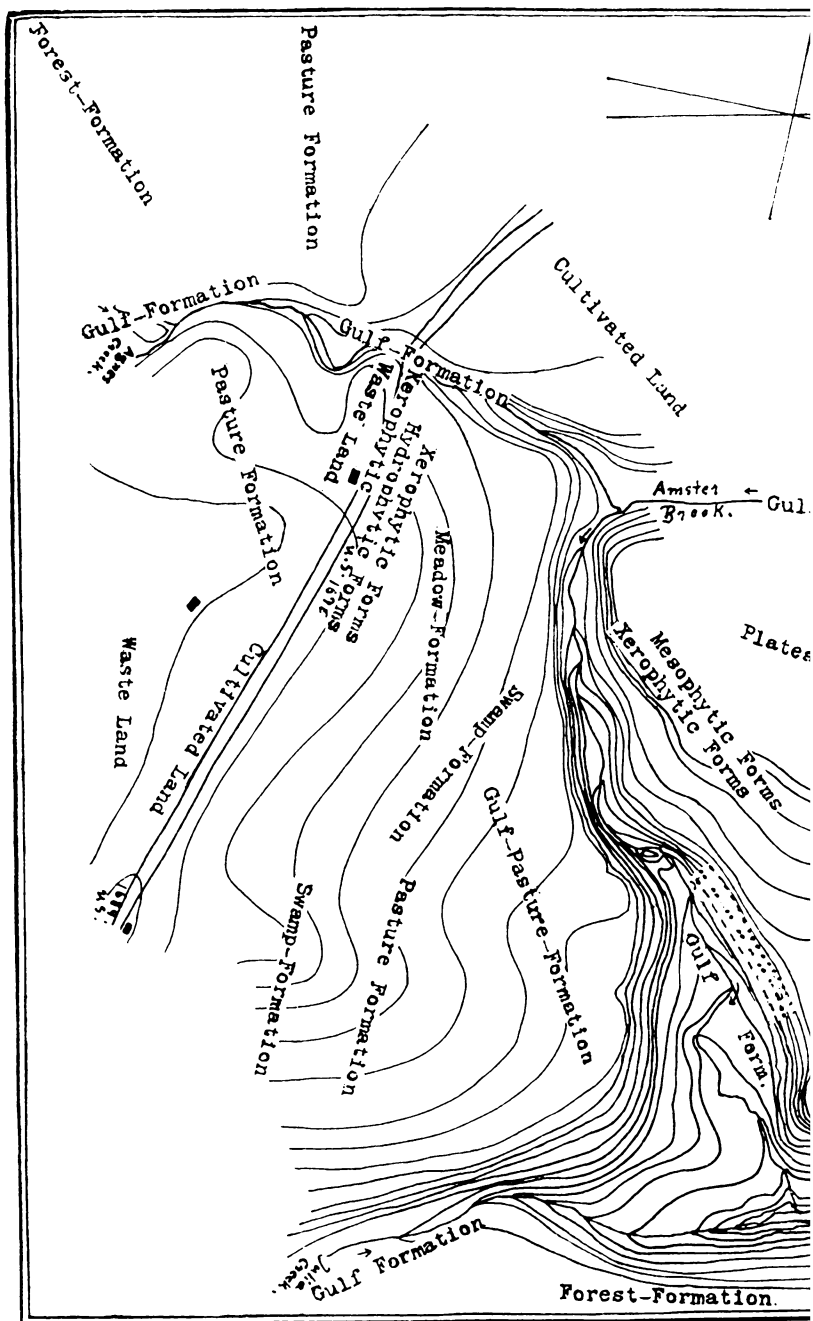
tually favor a combination of spring and swamp formation, and as a matter of fact there occur spring-swamp formations in the higher levels of the slopes and swamp-spring formations in the lower levels and in the bottom of gulfs and valleys.

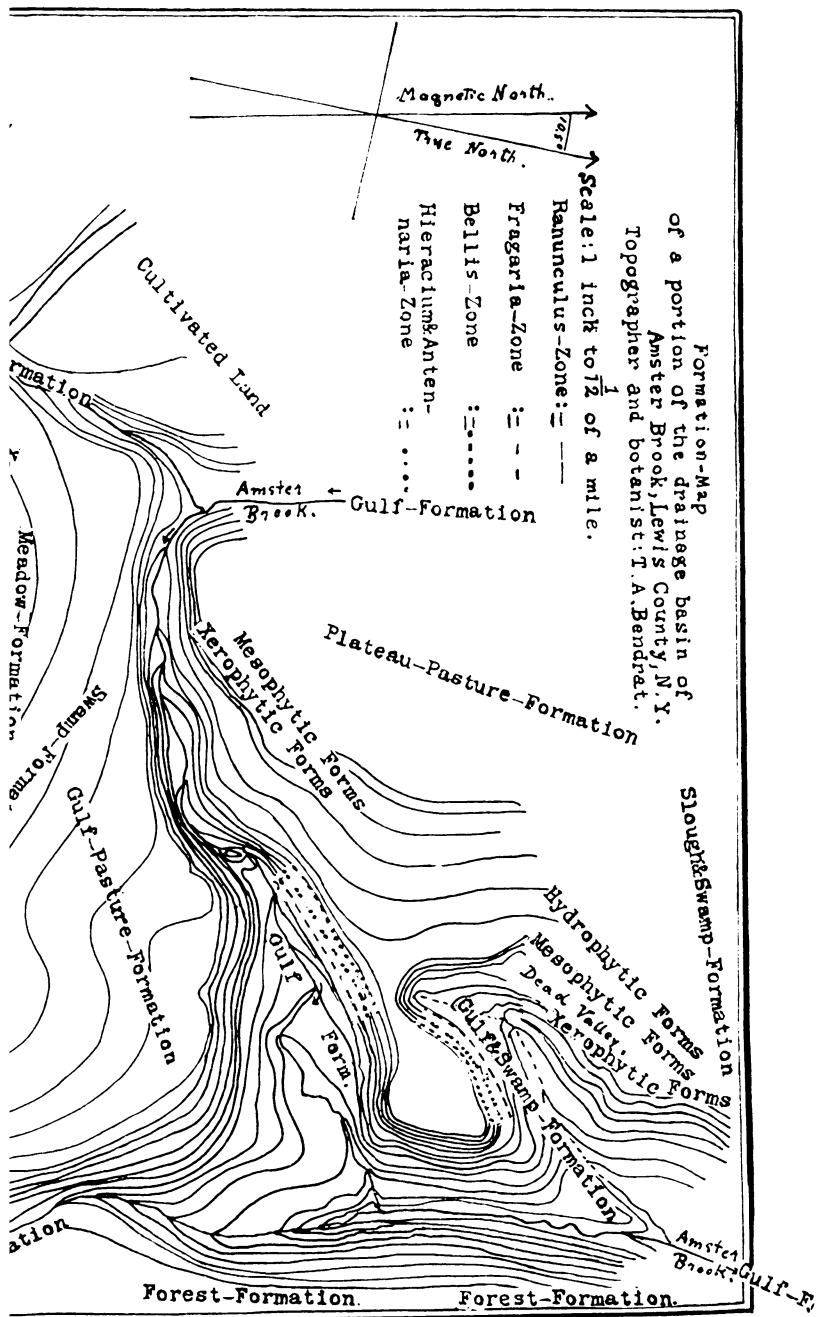
While on the whole bilateral zonation within the area under discussion is extremely rare or practically absent, it is interesting to observe how unilateral vertical zonation has established itself, where conditions of water content as well as orientation and inclination of slope, permit. Especially the slopes of Amster Brook gulf as well as those of Dead Valley afford some striking illustrations in this respect. (See Map.)

Another very interesting feature that tends to illustrate the bearing of the factor of the orientation of gulfs and valleys upon the distribution of the vegetation, is met with in Dead Valley. Where the carpet of the northern slope, exposed to moisture-bearing southeast and east winds, is almost exclusively composed of *Ranunculus pennsylvanicus*, while on the same level on the opposite slope, facing the drier north and northwest winds, *Hieracium pilosella* forms a close carpet. (See Map.)

The following are the species that usually constitute the plateau-gulf and valley formation:

<i>Abies balsamea</i>	<i>Caulophyllum thalictroides</i>
<i>Acer Saccharum</i>	<i>Cerastium nutans</i>
<i>Acer rubrum</i>	<i>Chelone glabra</i>
<i>Agrimonia hirsuta</i>	<i>Chrysosplenium americanum</i>
<i>Alnus incana</i>	<i>Circaea alpina</i>
<i>Antennaria plantaginifolia</i>	<i>Clematis virginiana</i>
<i>Apocynum androsaemifolium</i>	<i>Cynoglossum officinale</i>
<i>Aquilegia canadensis</i>	<i>Epilobium angustifolium</i>
<i>Asclepias incarnata</i>	<i>Epilobium molle</i>
<i>Bidens connata</i>	<i>Epilobium palustre</i>
<i>Melissa clinopodium</i>	<i>Erigeron strigosus</i>
<i>Cardamine hirsuta</i>	<i>Eupatorium perfoliatum</i>
<i>Carex gynandra</i>	<i>Eupatorium purpureum</i>
<i>Carex pauciflora</i>	<i>Fagus grandifolia</i>
<i>Carex tribuloides</i> var. <i>moniliformis</i>	<i>Fragaria canadensis</i>
	<i>Fragaria virginiana</i>





<i>Galium asprellum</i>	<i>Prunus virginiana</i>
<i>Galium triflorum</i>	<i>Pyrola elliptica</i>
<i>Gaultheria procumbens</i>	<i>Ranunculus abortivus</i>
<i>Hicoria minima</i>	<i>Ranunculus canadensis</i>
<i>Hieracium pilosella</i>	<i>Ranunculus pennsylvanicus</i>
<i>Hypericum ellipticum</i>	<i>Ranunculus recurvatus</i>
<i>Hypericum mutilum</i>	<i>Rubus odoratus</i>
<i>Hypericum perforatum</i>	<i>Rubus strigosus</i>
<i>Impatiens fulva</i>	<i>Rubus villosus</i>
<i>Impatiens pallida</i>	<i>Salix alba</i> var. <i>vitellina</i>
<i>Iris versicolor</i>	<i>Salix fragilis</i>
<i>Juglans cinerea</i>	<i>Salix viminalis</i>
<i>Juncus canadensis</i>	<i>Scrophularia marylandica</i>
<i>Juncus marginatus</i>	<i>Scutellaria lateriflora</i>
<i>Larix laricina</i>	<i>Senecio aureus</i>
<i>Leptamnium virginianum</i>	<i>Senecio lobatus</i>
<i>Lobelia cardinalis</i>	<i>Smilacina biflora</i>
<i>Lobelia inflata</i>	<i>Solidago canadensis</i>
<i>Lophanthus scrophulariifolius</i>	<i>Solidago lanceolata</i>
<i>Lycopus virginicus</i>	<i>Solidago latifolia</i>
<i>Medeola virginica</i>	<i>Sparganium simplex</i>
<i>Mentha canadensis</i>	<i>Gyrostachys gracilis</i>
<i>Mentha rotundifolia</i>	<i>Stachys palustris</i>
<i>Mimulus ringens</i>	<i>Teucrium canadense</i>
<i>Monarda didyma</i>	<i>Thalictrum dioicum</i>
<i>Monotropa uniflora</i>	<i>Thuja occidentalis</i>
<i>Myosotis palustris</i>	<i>Tiarella cordifolia</i>
<i>Oxalis Acetosella</i>	<i>Trillium cernuum</i>
<i>Oxalis cymosa</i>	<i>Trillium erectum</i>
<i>Oxalis stricta</i>	<i>Ulmus americana</i>
<i>Panicum Crus-Galli</i>	<i>Urticastrum divaricatum</i>
<i>Panicum capillare</i>	<i>Uvularia sessilifolia</i>
<i>Panicum sanguinale</i>	<i>Veratrum viride</i>
<i>Picea brevifolia</i>	<i>Verbena bracteosa</i>
<i>Picea Mariana</i>	<i>Verbena hastata</i>
<i>Pinus resinosa</i>	<i>Veronica scutellaria</i>
<i>Populus tremuloides</i>	<i>Viburnum alnifolium</i>

*Viola blanda**Viola rotundifolia**Viola pubescens*

As will be readily seen from the list, this formation is more complex and varied than all the others. Forest, meadow, swamp, spring and pasture formations have played a role, to a greater or less extent, in establishing a gulf and valley formation that is characteristic of the plateau-region of the state of New York at an average elevation of 1,700 feet above sea-level.

5. Plateau-Pasture Formation

This is the only formation that has been established through the lumbering activity of man, and the more or less complete destruction of the typical forest-flora tends to introduce conditions that would favor a rather complex succession which, if left to itself, would finally reestablish the original conditions. But the succession is checked at present by the cattle feeding upon it, and the formation retained in a mixed xero-mesophytic condition, while the presence of several more or less extensive swamps aid in the establishment of at least a partial horizontal zonation, in which hydrophytic forms become gradually replaced by mesophytic ones and these in turn yield to more or less xerophytic species, especially where a plateau-swamp is adjacent to a crest.

The plants found are as follows:

*Achillea Millefolium**Panicum capillare**Acer Saccharum**Panicum sanguinale**Alnus viridis**Poa annua**Bellis perennis**Ranunculus pennsylvanicus**Brunella vulgaris**Sisyrinchium bermudianum**Campanula americana**Gyrostachys cernua**Fragaria virginiana**Ulmus americana**Hieracium pilosella**Verbena bracteosa**Lycopodium complanatum**Viola obliqua**Lycopodium obscurum* var. *den-*
droideum

The subjoined map, comprising part of the area discussed, namely the greater part of the drainage basin of Amster Brook, will serve to illustrate some of the facts brought out in this paper.

The writer desires to acknowledge very gratefully the assistance given him in the identification of some sedges and mosses by Prof. Charles H. Peck, and Mr. Stewart Burnham.

UNIVERSITY OF NORTH CAROLINA

SHORTER NOTES

A YELLOW FLAX FROM JAMAICA, WEST INDIES.—It was somewhat of a surprise to find specimens of a yellow-flowered flax—*Cathartolinum*—in a package of specimens recently collected in a botanically little-known part of Jamaica. These specimens are the first representatives of the genus *Cathartolinum* to be found in the West Indies south of the Bahamas.

Cathartolinum jamaicense Small, sp. nov. Plants perennial, 3 dm. tall or less; stem slender, glabrous, simple or with few elongate branches: leaves nearly erect or appressed to the stem and the branches, mostly 7–12 mm. long; the blades spatulate to nearly linear, acute to short-acuminate, entire, eciliate, those of the upper leaves sessile: stipular glands wanting: flowers in interrupted, usually simple virgate spike-like racemes: sepals about 3 mm. long, the outer lanceolate to oblong-lanceolate, acute or slightly acuminate, glandless, the inner elliptic or ovate-elliptic, rather abruptly short-acuminate, often minutely glandular-toothed, the glands often deciduous: petals yellow, mostly 4.5–7.5 mm. long, fugacious: staminodia wanting: anthers about 0.5 mm. long: capsules globose-ovoid, about 2.5 mm. long, about equalling the sepals or slightly exceeding them.

In damp grassy savannas, Kellits, Upper Clarendon, Jamaica. Collected by William Harris, September 24, 1912, 11159.

The closest relative of *Cathartolinum jamaicense* seems to be *C. floridanum*. The simple virgate inflorescence and the smaller calyx of *C. jamaicense* distinguishes it from *C. floridanum*. In *North American Flora* this species should stand between *Cathartolinum floridanum* and *C. macrosepalum*.

J. K. SMALL